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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,810	09/26/2003	Hsueh Sung Tung	H0005034	6883

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EXAMINER

WITHERSPOON, SIKARL A

ART UNIT

PAPER NUMBER

1621

DATE MAILED: 01/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/671,810

Applicant(s)

TUNG ET AL.

Examiner

Sikar A. Witherspoon

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-68 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-68 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/26/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 7, 9 and 10 rejected under 35 U.S.C. 102(b) as being anticipated by Henne et al (J. Amer. Chem. Soc. 1946).

Henne et al disclose a process for making pentafluoropropene wherein 1-chloro-1,1,3,3,3-pentafluoropropane is reacted with alcoholic potassium hydroxide to produce said pentafluoropropene (col. 2, second paragraph). The reference is silent with regard to reaction temperature and pressure, and as such, it has been presumed that the reaction is conducted at standard temperature and pressure. Therefore, the process described herein by Henne et al anticipates the instant claims.

Claims 32, 35, and 38-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Mallikarjuna et al (US 6,031,141).

Art Unit: 1621

Mallikarjuna et al disclose a process wherein hexafluoropropane (HFC-236fa) is dehydrofluorinated by reacting said compound at a temperature of 300 to 400° C in the presence of a trivalent chromium fluoride catalyst to form 1,1,3,3,3-pentafluoropropene (col. 6, lines 35-55). The process herein described anticipates the instant claims.

Claims 2 and 3, although not anticipated along with claims 1, 4, 7, 9 and 10 above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Henne et al, and further in view of Merkel et al (US 6,274,779).

The instant claims further limit the dehydrohalogenation process of claim 1 wherein the pentafluoropropene produced by said dehydrohalogenation process is purified. Henne et al do not teach the purification of the pentafluoropropene product; however, Merkel et al teach a process for purifying hexafluoropropane wherein said product is washed with a caustic solution, followed by drying, i.e., with calcium sulfate or molecular sieves, and subsequent distilling (abstract and col. 2, line 15 to col. 4, line 62).

Although Merkel et al teach the purification of a different product, i.e., a fluoropropane, instead of a fluoropropene, the examiner, nonetheless, takes the position it would have been obvious to a person of ordinary to employ the purification process taught by Merkel et al in the dehydrofluorination process taught by Henne et al. A person of ordinary skill would have recognized that the purification steps taught by Merkel et al would be effective for purifying halohydrocarbons in general, and therefore would have been motivated to employ the purification process taught by Merkel et al by

Art Unit: 1621

the desire to purify the halohydrocarbon, i.e. pentafluoropropene obtained by the dehydrofluorination process taught by Henne et al.

Claims 5, 6, 8, and 11-31, although not anticipated, are rejected under 35 U.S.C. 103(a) as being unpatentable over Henne et al as applied to claims 1, 4, 7, 9 and 10 above, and further in view of Nappa et al (US 5,414,165) and Tung et al (US 5,902,912) in combination.

The instant claims add further limitations to the dehydrohalogenation process of claim wherein a specific range of caustic concentration is employed, and wherein the reactants of the dehydrofluorination reaction are 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane, and are prepared by fluorination hexachloropropane with hydrogen fluoride in the presence of a fluorination catalyst, in the vapor and liquid phases.

Neither Henne et al nor Merkel et teach the specific range caustic concentration recited by instant claim 11; nor do the references teach the method by which the dehydrohalogenation reactants were prepared.

With regard to the first difference, the examiner purports that while Henne et al is silent with regard to the concentration of the caustic material, it would have been obvious to a person of ordinary skill in the art to conduct the dehydrofluorination reaction employing *any* concentration of caustic solution that would have afforded an optimal conversion of the reactant to the fluoropropene product, absent a showing of

Art Unit: 1621

unexpected results by applicants when employing a caustic concentration in the range recited in the instant claims.

As stated above, Henne et al do not teach the method by which the reactants are prepared; however, Nappa et al teach a process for preparing hexafluoropropane, as well as its haloprecursors, including 1-chloro-1,1,3,3,3-pentafluoropropane, by reacting hexachloropropane with hydrogen fluoride in the vapor phase, at a temperature from 200 to about 400° C, in the presence of a trivalent chromium catalyst (abstract). The molar ratio of hydrogen fluoride to pentachloropropane is in the range of 1 to 1 to 100 to 1, and the pressure is not critical (col. 3, line 40 to col. 4, line 6).

Tung et al teach a similar process to that of Nappa et al for preparing hydrofluorocarbons such as hexafluoropropane wherein the reaction is conducted in the liquid phase, and fluorination catalysts comprising halides of antimony, tantalum, molybdenum, tin, and niobium, may be employed, and the catalyst may be regenerated by adding chlorine, and at a reaction temperature of 30 to 200° C (col. 4, line 37 to col. 5, line 39).

It therefore would have been obvious to a person of ordinary skill in the art to combine the fluorination process taught by Nappa et al, and Tung et al, wherein it is taught that fluorination catalysts other than trivalent chromium may be employed and that a liquid phase fluorination process can be employed, with the dehydrofluorination process taught by Henne et al. A person of ordinary skill would have been motivated to combine such teachings by the desire to prepare the halopropane precursor(s) that

Art Unit: 1621

would be dehydrohalogenated to produce the desired fluoropropene in the process taught by Henne et al.

It would have been rendered further obvious that both 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane could be dehydrohalogenated simultaneously to product the target fluoropropene, i.e., 1,1,3,3,3-pentafluoropropene, in the process taught by Henne et al, since Nappa et al teach that 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane are co-products produced in the fluorination of hexachloropropane, and as such, it would have been reasonable to expect that the starting material, i.e., halopropane in the process of Henne et al would comprise a mixture of the two previously mentioned halopropanes, if said mixture was prepared by the fluorination process taught by Nappa al.

Claims 33, 34, 36, 37, and 44-68, although not anticipated as are claims 32, 35, and 38-43 above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Mallikarjuna et al, and further in view of Nappa et al and Tung et al.

The instant claims further limit the thermal dehydrohalogenation of claim 32 to that catalyst being an iron, nickel, or cobalt halide, and, the reactants of the dehydrofluorination reaction being 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane, and are prepared by fluorination hexachloropropane with hydrogen fluoride in the presence of a fluorination catalyst, in the vapor and liquid phases.

Art Unit: 1621

The differences between Mallikarjuna et al and the present claims are that Mallikarjuna et al only teach a trivalent chromium catalyst that may be supported or unsupported, and does not teach the method by which *both* of the reactants of the instant dehydrohalogenation process are prepared.

With regard to the first difference, the examiner purports that the trivalent chromium catalyst taught by Mallikarjuna et al renders the iron, nickel, or cobalt halide catalyst of the present claims obvious, since all of the catalyst mentioned are transition metal-based catalysts. To that end, the examiner takes the position that absent a showing of unexpected results, by applicants, when employing the transition metals specifically recited in the present invention, it would have been obvious to a person of ordinary skill in the art to employ any transition metal halide catalyst in the process taught by Mallikarjuna et al, since one of ordinary skill would reasonably expect that a transition metal other than trivalent chromium would effectively catalyze the thermal decomposition of the halohydrocarbon reactant.

As stated above, Mallikarjuna et al do not teach the method by which both of the reactants are prepared; however, the reference does teach at column 3, lines 3-7, that hexafluoropropane can be prepared by contacting hydrogen fluoride and hexachloropropane in the vapor phase, in the presence of a trivalent chromium catalyst, as per US 4,414,165 to Nappa et al. Furthermore, Nappa et al teach a process for preparing hexafluoropropane, as well as its haloprecursors, including 1-chloro-1,1,3,3,3-pentafluoropropane, by reacting hexachloropropane with hydrogen fluoride in the vapor

Art Unit: 1621

phase, at a temperature from 200 to about 400° C, in the presence of a trivalent chromium catalyst (abstract). The molar ratio of hydrogen fluoride to pentachloropropane is in the range of 1 to 1 to 100 to 1, and the pressure is not critical (col. 3, line 40 to col. 4, line 6).

Tung et al teach a similar process to that of Nappa et al for preparing hydrofluorocarbons such as hexafluoropropane wherein the reaction is conducted in the liquid phase, and fluorination catalysts comprising halides of antimony, tantalum, molybdenum, tin, and niobium, may be employed, and the catalyst may be regenerated by adding chlorine, and at a reaction temperature of 30 to 200° C (col. 4, line 37 to col. 5, line 39).

It therefore would have been obvious to a person of ordinary skill in the art to combine the fluorination process taught by Nappa et al, and Tung et al, wherein it is taught that fluorination catalysts other than trivalent chromium may be employed and that a liquid phase fluorination process can be employed, with the dehydrofluorination process taught by Mallikarjuna et al. A person of ordinary skill would have been motivated to combine such teachings by the desire to prepare the halopropane precursor(s) that would be dehydrohalogenated to produce the desired fluoropropene in the process taught by Mallikarjuna et al.

It would have been rendered further obvious that both 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane could be dehydrohalogenated simultaneously to product the target fluoropropene, i.e., 1,1,3,3,3-pentafluoropropene, in

Art Unit: 1621

the process taught by Mallikarjuna et al, since Nappa et al teach that 1-chloro-1,1,3,3,3-pentafluoropropane and 1,1,1,3,3,3-hexafluoropropane are co-products produced in the fluorination of hexachloropropane, and as such, it would have been reasonable to expect that the starting material, i.e., halopropane in the process of Mallikarjuna et al would comprise a mixture of the two previously mentioned halopropanes, if said mixture was prepared by the fluorination process taught by Nappa al.

Claim Objections

Claims 31 and 62 objected to because of the following informalities: claim 31 lacks proper punctuation; claim 62 incorrectly reads "4500° C". Appropriate correction is required.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikarl A. Witherspoon whose telephone number is 571-272-0649. The examiner can normally be reached on M-F 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Johann Richter can be reached on 571-272-0646. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1621

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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